

CLAIMS

What is claimed is:

1. A method for charging at least one battery, comprising the steps of:
 - (a) determining a status of at least one parameter for the at least one battery, wherein
5 the at least one parameter comprises a closeness to a desired charge level;
 - (b) determining that the at least one battery is to be charged during a peak usage time period; and
 - (c) determining a priority rating for the at least one battery based upon the at least one parameter, wherein a battery closer to the desired charge level has a higher priority rating.
- 10 2. The method of claim 1, wherein the at least one parameter comprises a current charge level for the at least one battery.
- 15 3. The method of claim 1, wherein the at least one parameter comprises a time to charge the at least one battery to the desired charge level at a nominal charge rate for the at least one battery.
- 20 4. The method of claim 1, wherein the at least one parameter comprises one or more of the group consisting of:
 - an ID or serial number for the at least one battery;
 - a nominal charge rate for the at least one battery;
 - a type of device to be powered by the at least one battery; and

a type of user to use a device powered by the at least one battery.

5. The method of claim 1, wherein the determining step (a) comprises:

(a1) determining a number of a plurality of batteries to be charged; and

5 (a2) determining the status of the at least one parameter for each of the plurality of batteries.

6. The method of claim 5, wherein the determining step (b) comprises:

10 (b1) determining if the plurality of batteries are to be charged during the peak usage time period or an off-peak usage time period.

7. The method of claim 6, wherein the determining step (c) comprises:

15 (c1) calculating a peak charge schedule, if the plurality of batteries are to be charged during the peak usage time period; and

(c2) calculating an off-peak charge schedule, if the plurality of batteries are to be charged during the off-peak usage time period.

8. The method of claim 7, wherein for each of the plurality of batteries, the

calculating a peak charge schedule step (c1) comprises:

20 (c1i) determining a current charge level for the battery;

(c1ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery;

(c1iii) determining a priority rating for the battery based at least upon the current charge level of the battery and the time to charge the battery to the desired charge level, wherein the battery has a high priority rating if the current charge level is close to the desired charge level; and

5 (civ) setting a charge rate for the battery based upon the priority rating.

9. The method of claim 7, wherein for each of the plurality of batteries, the calculating an off-peak charge schedule step (c2) comprises:

10 (c2i) determining a current charge level for the battery;

(c2ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery;

(c2iii) determining a time available for charging the battery;

(c2iv) adjusting the time to charge the battery to the desired charge level based upon the time available for charging the battery; and

15 (c2v) setting a charge rate for the battery based at least on the adjusted time to charge the battery to the desired charge level and the current charge level of the battery.

10. The method of claim 7, further comprising:

(d) charging the plurality of batteries according to the peak or off-peak charge

20 schedule.

11. The method of claim 7, wherein for each of the plurality of batteries, the method

further comprises:

(d) comparing an overcharge accumulator value for the battery with a maximum time limit value;

5 (e) comparing a charge rate for the battery in the peak or off-peak charge schedule with a nominal charge rate for the battery, if the overcharge accumulator value is less than the maximum time limit value;

(f) incrementing the overcharge accumulator value if the charge rate for the battery in the schedule is higher than the nominal charge rate for the battery, if the overcharge accumulator value for the battery is less than the maximum time limit value;

10 (g) decrementing the overcharge accumulator value if the charge rate for the battery in the schedule is lower than the nominal charge rate for the battery, if the overcharge accumulator value for the battery is less than the maximum time limit value;

(h) setting the charge rate for the battery to the charge rate in the schedule, if the overcharge accumulator value for the battery is less than the maximum time limit value; and

15 (i) setting the charge rate for the battery to the nominal charge rate for the battery, or to a charge rate lower than the nominal charge rate, if the overcharge accumulator value for the battery equals or exceeds the maximum time limit value.

12. A method for charging a plurality of batteries, comprising the steps of:

20 (a) determining a status of at least one parameter for each of the plurality of batteries, wherein the at least one parameter comprises a closeness to a desired charge level;

(b) determining if the plurality of batteries are to be charged during a peak usage time

period or an off-peak usage time period;

(c) calculating a peak charge schedule, if the plurality of batteries are to be charged during the peak usage time period, comprising:

(c1) determining a priority rating for each of the plurality of batteries based upon the at least one parameter, wherein a battery closer to the desired charge level has a higher priority rating, and

(c2) setting a charge rate for each of the plurality of batteries based upon the priority rating for each of the plurality of batteries; and

(d) calculating an off-peak charge schedule, if the plurality of batteries are to be charged during the off-peak usage time period, comprising:

(d1) setting the charge rate for each of the plurality of batteries based at least upon the at least one parameter and a time available for charging the battery.

13. The method of claim 12, wherein for each of the plurality of batteries, the determining step (c1) comprises:

(c1i) determining a current charge level for the battery;

(c1ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery; and

(c1iii) determining the priority rating for the battery based at least upon the current charge level of the battery and the time to charge the battery to the desired charge level, wherein the battery has a high priority rating if the current charge level is close to the desired charge level.

14. The method of claim 12, wherein for each of the plurality of batteries, the setting
step (d1) comprises:

(d1i) determining a current charge level for the battery;

5 (d1ii) determining a time to charge the battery to the desired charge level at a nominal
charge rate for the battery;

(d1iii) determining the time available for charging the battery;

(d1iv) adjusting the time to charge the battery to the desired charge level based upon the
time available for charging the battery; and

10 (d1v) setting the charge rate for the battery based at least on the adjusted time to charge
the battery to the desired charge level and the current charge level of the battery.

15. The method of claim 12, wherein the desired charge level is predetermined to be less
than a complete charge for the battery and greater than the current charge level for the battery.

16. The method of claim 15, wherein the desired charge level is no greater than 90% of a
complete charge for the battery.

15 17. A computer readable medium with program instructions for charging at least one
battery, comprising the instructions for:

(a) determining a status of at least one parameter for the at least one battery, wherein
the at least one parameter comprises a closeness to a desired charge level;

20 (b) determining that the at least one battery is to be charged during a peak usage time
period; and

(c) determining a priority rating for the at least one battery based upon the at least one
parameter, wherein a battery closer to the desired charge level has a higher priority rating.

18. The medium of claim 17, wherein the at least one parameter comprises a current charge level for the at least one battery.

5 19. The medium of claim 17, wherein the at least one parameter comprises a time to charge the at least one battery to the desired charge level at a nominal charge rate for the at least one battery.

10 20. The medium of claim 17, wherein the at least one parameter comprises one or more of the group consisting of:

- an ID or serial number for the at least one battery;
- a nominal charge rate for the at least one battery;
- a type of device to be powered by the at least one battery; and
- a type of user to use a device powered by the at least one battery.

15 21. The medium of claim 17, wherein the determining instruction (a) comprises instructions for:

- (a1) determining a number of a plurality of batteries to be charged; and
- (a2) determining the status of the at least one parameter for each of the plurality of batteries.

20 22. The medium of claim 21, wherein the determining instruction (b) comprises

instructions for:

(b1) determining if the plurality of batteries are to be charged during the peak usage time period or an off-peak usage time period.

5 23. The medium of claim 22, wherein the determining instruction (c) comprises instructions for:

(c1) calculating a peak charge schedule, if the plurality of batteries are to be charged during the peak usage time period; and

10 (c2) calculating an off-peak charge schedule, if the plurality of batteries are to be charged during the off-peak usage time period.

24. The medium of claim 23, wherein for each of the plurality of batteries, the calculating a peak charge schedule instruction (c1) comprises instructions for:

15 (c1i) determining a current charge level for the battery;

 (c1ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery;

 (c1iii) determining a priority rating for the battery based at least upon the current charge level of the battery and the time to charge the battery to the desired charge level, wherein the battery has a high priority rating if the current charge level is close to the desired charge level;

20 and

 (c1iv) setting a charge rate for the battery based upon the priority rating.

25. The medium of claim 23, wherein for each of the plurality of batteries, the calculating an off-peak charge schedule instruction (c2) comprises instructions for:

(c2i) determining a current charge level for the battery;

5 (c2ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery;

(c2iii) determining a time available for charging the battery;

10 (c2iv) adjusting the time to charge the battery to the desired charge level based upon the time available for charging the battery; and

(c2v) setting a charge rate for the battery based at least on the adjusted time to charge

the battery to the desired charge level and the current charge level of the battery.

26. The medium of claim 23, further comprising instructions for:

15 (d) charging the plurality of batteries according to the peak or off-peak charge schedule.

27. The medium of claim 23, wherein for each of the plurality of batteries, the

instructions further comprises instructions for:

(d) comparing an overcharge accumulator value for the battery with a maximum time limit value;

20 (e) comparing a charge rate for the battery in the peak or off-peak charge schedule with a nominal charge rate for the battery, if the overcharge accumulator value is less than the maximum time limit value;

(f) incrementing the overcharge accumulator value if the charge rate for the battery in the schedule is higher than the nominal charge rate for the battery, if the overcharge accumulator value for the battery is less than the maximum time limit value;

5 (g) decrementing the overcharge accumulator value if the charge rate for the battery in the schedule is lower than the nominal charge rate for the battery, if the overcharge accumulator value for the battery is less than the maximum time limit value;

(h) setting the charge rate for the battery to the charge rate in the schedule, if the overcharge accumulator value for the battery is less than the maximum time limit value; and

10 (i) setting the charge rate for the battery to the nominal charge rate for the battery, or to a charge rate lower than the nominal charge rate, if the overcharge accumulator value for the battery equals or exceeds the maximum time limit value.

28. A computer readable medium with program instructions for charging a plurality of batteries, comprising the instructions for:

(a) determining a status of at least one parameter for each of the plurality of batteries, wherein the at least one parameter comprises a closeness to a desired charge level;

15 (b) determining if the plurality of batteries are to be charged during a peak usage time period or an off-peak usage time period;

(c) calculating a peak charge schedule, if the plurality of batteries are to be charged during the peak usage time period, comprising:

20 (c1) determining a priority rating for each of the plurality of batteries based upon the at least one parameter, wherein a battery closer to the desired charge level has a higher priority rating, and

(c2) setting a charge rate for each of the plurality of batteries based upon the priority rating for each of the plurality of batteries; and

(d) calculating an off-peak charge schedule, if the plurality of batteries are to be charged during the off-peak usage time period, comprising:

5 (d1) setting the charge rate for each of the plurality of batteries based at least upon the at least one parameter and a time available for charging the battery.

29. The medium of claim 28, wherein for each of the plurality of batteries, the determining instructions (c1) comprises instructions for:

10 (c1i) determining a current charge level for the battery;
(c1ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery; and
(c1iii) determining the priority rating for the battery based at least upon the current charge level of the battery and the time to charge the battery to the desired charge level, wherein
15 the battery has a high priority rating if the current charge level is close to the desired charge level.

30. The medium of claim 28, wherein for each of the plurality of batteries, the setting instruction (d1) comprises instructions for:

20 (d1i) determining a current charge level for the battery;
(d1ii) determining a time to charge the battery to the desired charge level at a nominal charge rate for the battery;
(d1iii) determining the time available for charging the battery;

(d1iv) adjusting the time to charge the battery to the desired charge level based upon the time available for charging the battery; and

(d1v) setting the charge rate for the battery based at least on the adjusted time to charge the battery to the desired charge level and the current charge level of the battery.